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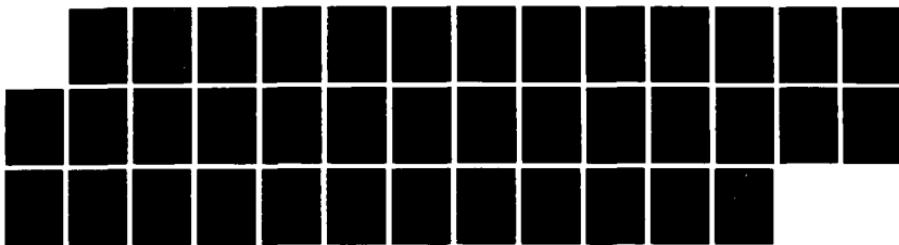
PUBSCOST: A MODEL THAT ACCURATELY DETERMINES COST OF
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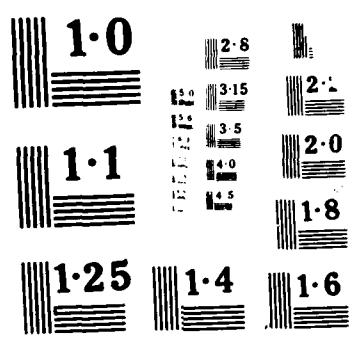
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PUBSCOST: A MODEL THAT ACCURATELY DETERMINES COST OF PUBLICATIONS

DR. THOMAS MATLEY
MR. VINCENT ARCONATI, JR.
OPERATIONS RESEARCH ANALYSTS

DECEMBER 1987

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PUBSCOST: A MODEL THAT ACCURATELY DETERMINES COST OF PUBLICATIONS

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Operations Research Analysts**

December 1987

**U. S. ARMY AVIATION SYSTEMS COMMAND
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Responding to the need to quantify the major cost drivers common to many programs, AVSCOM's Directorate for Systems and Cost Analysis, Developmental Cost Analysis Division, initiated the development of a computer model to provide a budgetary estimate of technical publications costs. Because of its capability to function independently of other cost models, PUBSCOST enables users to manipulate economic variables for "what if" situations. (Continued)		

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20. ABSTRACT (Continued)

The worksheets in the report and user oriented statements in the program structure and simplify the data gathering process to make it as efficient as possible. Toward these ends the user selects either specific data base or an industry average data base to calculate per page costs, total costs/publication and cumulative program costs. These include subelement costs for writing, editing, engineering, clerical, illustrating and layout. Output also includes validation/verification and technical manual plan costs, as well as direct labor, material, G&A, profit, and overhead.

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I. INTRODUCTION.

A. Purpose. This report discusses the PUBSCOST model which permits the user to independently estimate costs of publications, assists in costing systems where publications is a cost driver, therefore, facilitates in preparation of independent cost estimates, as well as the evaluation of proposals. The program enables the user to make a more accurate estimate of publications costs rather than using a percentage of investment costs.

B. Scope. This report provides the user with adequate direction to understand and smoothly run the model. It also provides guidance from the beginning to the end of the estimating process by offering worksheets which help users gather only the necessary information. This streamlines and expedites the data gathering procedure. Consequently, this system of worksheets and user directed statements in the model help to structure the data gathering function making this activity as mechanical as possible. The worksheets are also intended to serve as an historical record. Therefore, this report covers the spectrum of user estimating activity from data gathering to interpretation. Although following these procedures reduces user options to some extent, it should significantly reduce time spent in data collecting and, concomitantly, reduce errors and minimize false starts.

C. Background. The Developmental Cost Division of the Directorate for Systems and Cost Analysis at USAAVSCOM perceived the need for a method that could quickly let the user estimate cost of a large publications effort. For example, in estimating a proposal in which costs were not presented in DA PAM format but by functional areas, Developmental Cost found it necessary also to estimate costs by functional areas to make an apples-to-apples comparison. The same experience has been repeated on Source Selection

Evaluation Boards in which the Independent Cost Estimate required an estimate of costs of publications as part of total baseline costs. The following program resolves these dilemmas, and our on-going efforts will continue to deal with related concerns and improve those here.

II. METHODOLOGY.

The rate file is read from the default drive.

A. Inputting Data.

1. The user selects either the contractor type or industry average data base. The contractor options include engine and airframe data as part of the mix.

2. From an analogous system, the user divines the number of text pages using guidance provided on the PUBSCOST worksheets (Appendix A). The model is run initially for text page count and a second time for illustration count.

3. The user selects General and Administrative (G&A) costs which include cost of management, supervision, benefits, etc.. These may vary from 15% to 25% of base rate.

4. The overhead includes costs to keep the facility; lights, gas, buildings and grounds, etc.. These may vary from 130% to 200% of base rate.

5. Profit is based on the amount of risk inherent in the contract and may vary from 10% to 15% of the average hourly rate.

6. The user selects the level of effort as a two digit number.

a. The first number is one level of effort/page as follows:

(1) AVUM/AVIM Maintenance manuals/MIL-M-63038.

(2) AVUM/AVIM Operator's and Maintenance Manuals/MIL-M-63036.

(3) Aircraft Operator's Manual/MIL-M-63029C.

- (4) Operator's and Crew Member's Checklist/MIL-M-63029C.
- (5) Aircraft Component Depot Maintenance Work Requirements (DMWR)/MIL-M-63041C.
- (6) Aircraft Phased Maintenance Inspections/MIL-M-63014.
- (7) Repair Parts and Special Tools List/MIL-M-63001F.
- (8) Modification Work Orders (MWOs)/MIL-M-63002.
- (9) Color Performance Chart/MIL-M-63029C.
- (10) Schematics.
- (11) Repair Parts Special Tools List (RPSTL).

b. The second level of effort selects either a new or change value for one of the following:

- (1) A simple level of effort as represented by standard, off-the-shelf tooling.
- (2) An average level of complexity as represented by standard off-the-shelf equipment.
- (3) A complex level is represented by all aircraft operators and AVUM/AVIM maintenance manuals and DMWRs.

c. The illustration level of effort is similarly selected. In making an illustration page determination, foldouts count as the equivalent number or page units, e.g., a fold out of 11" X 17" counts as two pages. The user selects a full-, half- or quarter-page of line art, or a schematic or RPSTL art as follows:

- (1) A simple, new or change, piece of line art.
- (2) An average, new or change item of line art.
- (3) A complex, new or changed, piece of line art.

The model is run initially for text page count, a second time for full-page illustrations, a third time for half-page illustrations and a fourth time for quarter-page illustrations.

7. Validation

a. Since the validation effort may vary in accordance with such variables as partial or 100% validation, actual or simulated, the model offers the user some discretion. The user determines the level of effort for the validation activity by estimating the number of hours required to validate each of the manuals. Twenty-four to thirty-two hours/manual is a rule of thumb. However, if more precise numbers are available publications personnel or the cognizant program people may have them. The program then establishes the validation cost of the writer, engineer and technician subelements and a validation cost/manual and total validation cost for the program.

b. If it is required to determine overtime, which this program does not independently calculate, adjust total hours upward to allow for the overtime factor. For example, 15 hours straight time accounts for 10 overtime hours at time and one-half.

8. Verification. Like the validation effort, the verification effort may vary. Therefore, the program offers the option of determining verification costs at the user's direction. The user enters the anticipated number of hours for the verification effort-usually the same number of hours required for validation. The model uses the writer's hourly rate to calculate a verification cost and a total program cost. However, neither travel, lodging nor relocation costs are included.

9. Cost of Materials. This code determines the shop cost of materials required in the publications effort. It includes non-labor cold type composition, photo composition, negatives (and associated costs) and printing costs, but does not include any subcontract costs. Costs of materials is 9% of direct labor costs.

10. Technical Manual Plan. PUBSCOST calculates the cost of developing the technical manual plan as 1.3% of total manual costs.

B. Output of Data. PUBSCOST calculates the following: direct labor costs according to the level of effort, the page cost/subelement, total costs and cumulative costs/page.

1. Per Page Costs. The per page costs include the subelements of writing, engineering, editing, illustrating, clerical and layout.

2. Total Costs. The program calculates total costs for direct labor, G&A, overhead, profit, and total contact costs.

3. Cum Costs/Page. These outputs include writing, engineering, editing, illustrating, clerical and layout.

4. Cum Totals. The cumulative totals include G&A, labor, overhead, profit, cost of materials, verification, validation and contract costs.

5. Hard Copy. The user can request a print-out of the data by responding "Yes" to the appropriate prompt.

APPENDIX A
PUBSCOST WORKSHEETS

III. APPENDIX A.

A. PUBS Worksheet.

1. Worksheet number 1 facilitates the data gathering, in-putting and interpreting process and simplifies and expedites the reporting process. The user begins by completing historical and reference information which includes system, date prepared, manual number, contractor (if industry data base is selected, write industry data base), the manual title and whether this a new or changed publication. To complete the remainder of the worksheet, acquire a similar manual, and make a text/illustration page count or call someone, probably in publications, who can provide this information. The information can be gleaned easily, usually in a few minutes. This information can be transcribed into the "Data Input" column. The "Contractors Estimate" column provides places to primarily transcribe data from the run to provide an historical record.

2. The hourly rate factor, if known, should be entered both for historical purposes and to provide a means to later update the data base. The validation column requests the anticipated number of hours that will be spent during validation, and these hours will be a constant for writer, engineer, and technician. If a completed validation plan is unavailable to determine level of effort in hours, select 24 to 32 hours per manual and use the same entry for verification.

3. Also for historical purposes, a column is provided to record PUBSCOST outputs including G&A profit, and total cost.

4. If additional information is needed, contact either one of the authors, at USAAVSCOM, AMSAV-B, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120-1798.

Table No. 1

COST ANALYSIS WORKSHEETS**COSTPUBS WORKSHEET No. 1**

System _____ Date Prepared _____

Manual Number _____ Contractor _____

Manual Title/No. _____

New _____ Changed _____

Classification of Equipment:	Simple	Average	Complex
-------------------------------------	---------------	----------------	----------------

Publication Breakdown	Cost Data
------------------------------	------------------

DATA INPUT	CONTRACTOR'S ESTIMATES
-------------------	-------------------------------

Text Pages _____ Hours Per Page _____

_____ Cost Per Page _____

_____ Other _____

ILLUSTRATIONS	_____
----------------------	-------

Full Page _____ Total Direct Labor Cost _____

Half Page _____ Total Overhead _____

Quarter Page _____ Total C&A _____

Schematics _____ Total Profit _____

No. of Pg UNITS _____ Total Cost _____

Parts Break Down (RPSTL) _____ Cost of Materials _____

Validation Cost _____

LEVEL OF EFFORT	Verification Cost
------------------------	--------------------------

Text _____ Text Manual Plan _____

Illustrations _____

ADMINISTRATIVE FACTORS

C&A _____

Overhead _____

Profit _____

Table No. 2

COSTPUBS WORKSHEET NO. 2

MANHOUR AVERAGES			
ELEMENT OF LABOR	HOURLY RATE	VALIDATION (NO OF HOURS)	VERIFICATION (Same as validation)
Writer	_____	_____	_____
Engineer	_____	_____	
Editor	_____		
Illustrator	_____		
		VALIDATION	
Clerical	_____		
Layout	_____		
Technician	_____		

APPENDIX B
SAMPLE RUNS

Airframe Data

B-1

THE COST OF A PAGE AT LEVEL 32 FOR
A F104 AIRFRAME TECHNICAL MANUAL
IS F20.40 EASY TO USE.

THE FOLLOWING IS THE COST PER PAGE FOR
WRITER ENGINEER EDITOR
 0.00 0.00 0.00
ILLUSTRATOR CLERICAL WORKER LAYOUT
 0.00 0.00 0.00

THE AVERAGE COST PER PAGE IS 0.00
THE TOTAL LABOR FOR 2 PAGES @ LEVEL 32 IS 0.00
THE TOTAL VALIDATION COST IS 102.42
THE TOTAL VERIFICATION COST IS 34.14
THE COST OF MATERIALS IS 12.29
THE TOTAL G&A IS 2.98
THE TOTAL OVERHEAD IS 3.04
THE TOTAL PROFIT IS 3.10
THE TOTAL CONTRACT COST IS 157.96

THE FOLLOWING IS THE CUM COST PER PAGE FOR
WRITER ENGINEER EDITOR
 0.00 0.00 0.00
ILLUSTRATOR CLERICAL WORKER LAYOUT
 0.00 0.00 0.00

THE CUM COST OF LABOR IS 0.00
THE CUM TOTAL VALIDATION COST IS 102.42
THE CUM TOTAL VERIFICATION COST IS 34.14
THE CUM COST OF MATERIALS IS 12.29
THE CUM TOTAL G&A IS 2.98
THE CUM TOTAL OVERHEAD IS 3.04
THE CUM TOTAL PROFIT IS 3.10
THE CUM TOTAL CONTRACT COST IS 157.96
THE TECH MANUAL PLAN COST IS 2.05
THE G&A USED IS 2 %
THE OVERHEAD USED IS 1 %
THE PROFIT USED IS 2 %
THE TOTAL VALIDATION HOURS USED IS 2
THE TOTAL VERIFICATION HOURS USED IS 2

Engine Data

B-2

THE COST OF 2 PAGES AT LEVEL 5A FOR
5 FOR AIRCRAFT ORDNANCE DEPOT MAINT WORK REQUIREMENTS (DHWRS)
6 FOR COMPLEX REVISED

THE FOLLOWING IS THE COST PER PAGE FOR

WRITER	ENGINEER	EDITOR
78.52	12.26	6.83
ILLUSTRATOR	CLERICAL WORKER	LAYOUT
0.00	4.98	8.05

THE AVERAGE COST PER PAGE IS 110.64

THE TOTAL LABOR FOR 2 PAGES @ LEVEL 5A IS 221.28

THE TOTAL VALIDATION COST IS 102.42

THE TOTAL VERIFICATION COST IS 34.14

THE COST OF MATERIALS IS 32.21

THE TOTAL GMA IS 7.80

THE TOTAL OVERHEAD IS 7.96

THE TOTAL PROFIT IS 8.12

THE TOTAL CONTRACT COST IS 413.92

THE TECH MANUAL PLAN COST IS 5.38

THE FOLLOWING IS THE CUM COST PER PAGE FOR

WRITER	ENGINEER	EDITOR
78.52	12.26	6.83
ILLUSTRATOR	CLERICAL WORKER	LAYOUT
0.00	4.98	8.05

THE CUM COST OF LABOR IS 221.28

THE CUM TOTAL VALIDATION COST IS 102.42

THE CUM TOTAL VERIFICATION COST IS 34.14

THE CUM COST OF MATERIALS IS 32.21

THE CUM TOTAL GMA IS 7.80

THE CUM TOTAL OVERHEAD IS 7.96

THE CUM TOTAL PROFIT IS 8.12

THE CUM TOTAL CONTRACT COST IS 413.92

THE CUM TECH MANUAL PLAN COST IS 5.38

THE GMA LOST IN CUM IS 0.00

THE OVERHEAD LOST IN CUM IS 0.00

THE PROFIT LOST IN CUM IS 0.00

THE TOTAL CONTRACT CONTRACT COST IS 413.92

THE TOTAL CONTRACT CONTRACT COST LOST IN CUM IS 0.00

Engine Data

B-3

THE COST OF 2 PAGES AT LEVEL 43 FOR
4 FOR OPERATOR'S & CREWMEMBER CHECKLIST
3 FOR AVERAGE NEA

THE FOLLOWING IS THE COST PER PAGE FOR

WRITER	ENGINEER	EDITOR
34.14	12.26	6.83
ILLUSTRATOR	CLERICAL WORKER	LAYOUT
0.00	4.98	8.05

THE AVERAGE COST PER PAGE IS 66.26
THE TOTAL LABOR FOR 2 PAGES @ LEVEL 43 IS 132.52
THE TOTAL VALIDATION COST IS 102.42
THE TOTAL VERIFICATION COST IS 34.14
THE COST OF MATERIALS IS 24.22
THE TOTAL G&M IS 5.87
THE TOTAL OVERHEAD IS 5.98
THE TOTAL PROFIT IS 6.10
THE TOTAL CONTRACT COST IS 311.25
THE TECH MANUAL PLAN COST IS 4.05

THE FOLLOWING IS THE CUM COST PER PAGE FOR

WRITER	ENGINEER	EDITOR
34.14	12.26	6.83
ILLUSTRATOR	CLERICAL WORKER	LAYOUT
0.00	4.98	8.05

THE CUM COST OF LABOR IS 132.52
THE CUM TOTAL VALIDATION COST IS 102.42
THE CUM TOTAL VERIFICATION COST IS 34.14
THE CUM COST OF MATERIALS IS 24.22
THE CUM TOTAL G&M IS 5.87
THE CUM TOTAL OVERHEAD IS 5.98
THE CUM TOTAL PROFIT IS 6.10
THE CUM TOTAL CONTRACT COST IS 311.25
THE CUM TECH MANUAL PLAN COST IS 4.05
THE G&P USED IS 2 %
THE OVERHEAD USED IS 2 %
THE PROFIT USED IS 2 %
THE TOTAL VALIDATION HOURS USED IS 2
THE TOTAL VERIFICATION HOURS USED IS 2

APPENDIX C
PROGRAM LISTING

Program Listing

C-1

PUBS.BAS

```
10 KEY OFF:CLS
20 DIM PROMPT$(11),PROMPT2$(6),FRMTA$(4)
30 COLOR 13 PRINT "THIS MODEL WILL CALCULATE THE COST OF MANUALS FOR THE FOLLOWING"
40 PRINT "INDUSTRY MIX: ENGINE AND AIRFRAME DATA"
50 PRINT "INDUSTRY AVERAGE."
60 PRINT
70 DIM RATES(4,9)
80 OPEN "RATES.DAT" FOR INPUT AS #1
90 FOR IX = 1 TO 4
100 FOR JX = 1 TO 9
110 INPUT #1, RATES(IX,JX)
120 NEXT JX
130 NEXT IX
140 CLOSE 1
150 CWRITE = 0
160 CENGINEER = 0
170 CEDITOR = 0
180 CILLUSTRATOR = 0
190 CCLERICAL = 0
200 CLAYOUT = 0
210 CVALIDATION = 0
220 CVERIFICATION = 0
230 CGTOTAL = 0
240 CXGTOTAL = 0
250 CGA = 0
260 COVHEAD = 0
270 CPROFIT = 0
280 CTOTCONTR = 0
290 CCOSTMAT = 0
300 CTECHPLAN = 0
310 PRINT "1 : AIRFRAME DATA"
320 PRINT "2 : ENGINE: EASTERN DATA"
330 PRINT "3 : ENGINE: MIDWESTERN DATA"
340 PRINT "4 : INDUSTRY AVERAGE"
350 INPUT "INPUT YOUR CHOICE"; AS
360 IF AS = "1" GOTO 440
370 IF AS = "2" GOTO 630
380 IF AS = "3" GOTO 820
390 IF AS = "4" GOTO 1010
400 PRINT
410 PRINT "ERROR IN CHOICE PLEASE RETRY"
420 GOTO 310
430 INPUT "NUMBER OF PAGES"; X
440 INPUT "PLACE DECIMAL"; GR
450 RZ=1
460 GOSUB 1080
470 INPUT INPUT G & A AS A TWO
480 IF QR > 1 THEN 510
490 G = QR
500 GOTO 520
510 G = QR/100
520 INPUT "INPUT OVERHEAD AS A TWO PLACE DECIMAL"; O
```

```

530 IF 0 > 1 THEN 560
540 OV = 0
550 GOTO 570
560 OV = 0/100
570 INPUT "INPUT PROFIT AS A TWO PLACE DECIMAL"; PR
580 IF PR > 1 THEN 610
590 P = PR
600 GOTO 620
610 P = PR/100
620 GOTO 1290
630 INPUT "NUMBER OF PAGES"; X
640 RZ=2
650 GOSUB 1080
660 INPUT "INPUT G & A AS A TWO PLACE DECIMAL"; QR
670 IF QR > 1 THEN 700
680 G = QR
690 GOTO 710
700 G = QR/100
710 INPUT "INPUT OVERHEAD AS A TWO PLACE DECIMAL"; O
720 IF O > 1 THEN 750
730 OV = 0
740 GOTO 760
750 OV = 0/100
760 INPUT "INPUT PROFIT AS A TWO PLACE DECIMAL"; PR
770 IF PR > 1 THEN 800
780 P = PR
790 GOTO 810
800 P = PR/100
810 GOTO 1290
820 INPUT "NUMBER OF PAGES"; X
830 RZ=3
840 GOSUB 1080
850 INPUT "INPUT G & A AS A TWO PLACE DECIMAL"; QR
860 IF QR > 1 THEN 890
870 G = QR
880 GOTO 900
890 G = QR/100
900 INPUT "INPUT OVERHEAD AS A TWO PLACE DECIMAL"; O
910 IF O > 1 THEN 940
920 OV = 0
930 GOTO 950
940 OV = 0/100
950 INPUT "INPUT PROFIT AS A TWO PLACE DECIMAL"; PR
960 IF PR > 1 THEN 990
970 P = PR
980 GOTO 1000
990 P = PR/100
1000 GOTO 1290
1010 INPUT "NUMBER OF PAGES"; X
1020 RZ=4
1030 GOSUB 1080
1040 INPUT "INPUT G & A AS A TWO PLACE DECIMAL"; QR
1050 IF QR > 1 THEN 1180
1060 G = QR
1070 GOTO 1190
1080 A=RATES(RZ,1)

```

1090 B=RATES(RX,2)
1100 C=RATES(RX,3)
1110 D=RATES(RX,4)
1120 E=RATES(RX,5)
1130 F=RATES(RX,6)
1140 G=RATES(RX,7)
1140 H=RATES(RX,8)
1150 I=RATES(RX,9)
1160 J=RATES(RX,0)
1170 RETURN
1180 G = QR/100
1190 INPUT "INPUT OVERHEAD AS A TWO PLACE DECIMAL"; O
1200 IF O > 1 THEN 1230
1210 OV = 0
1220 GOTO 1240
1230 OV = 0/100
1240 INPUT "INPUT PROFIT AS A TWO PLACE DECIMAL"; PR
1250 IF PR > 1 THEN 1280
1260 P = PR
1270 GOTO 1290
1280 P = PR/100
1290 INPUT "INPUT THE TOTAL HOURS FOR VALIDATION"; VH
1300 INPUT "INPUT THE TOTAL HOURS FOR VERIFICATION"; VN
1310 ,
1320 RESTORE 1390
1330 FOR P1% = 1 TO 11
1340 READ PROMPT1\$(P1%)
1350 NEXT P1%
1360 FOR P2% = 1 TO 6
1370 READ PROMPT2\$(P2%)
1380 NEXT P2%
1390 DATA "1 FOR AVUM/AVIM MAINTENANCE MANUALS"
1400 DATA "2 FOR AVUM/AVIM OPERATOR'S AND MAINTENANCE MANUALS"
1410 DATA "3 FOR AIRCRAFT OPERATOR'S MANUAL"
1420 DATA "4 FOR OPERATOR'S & CREWMEMBER CHECKLIST"
1430 DATA "5 FOR AIRCRAFT COMPONENT DEPOT MAINT WORK REQUIREMENTS (DMWRS)
1440 DATA "6 FOR AIRCRAFT PHASE MAINTENANCE INSPECTIONS"
1450 DATA "7 FOR REPAIR PARTS AND SPECIAL TOOLS LIST"
1460 DATA "8 FOR MODIFICATION WORK ORDERS"
1470 DATA "9 FOR MIL-M-63029C COLOR PERFORMANCE CHARTS"
1480 DATA "10 FOR SCHEMATICS"
1490 DATA "11 FOR PARTS BREAK DOWN (RPSTL)"
1500 ,
1510 DATA "1 FOR EASY NEW"
1520 DATA "2 FOR EASY REVISED"
1530 DATA "3 FOR AVERAGE NEW"
1540 DATA "4 FOR AVERAGE REVISED"
1550 DATA "5 FOR COMPLEX NEW"
1560 DATA "6 FOR COMPLEX REVISED"
1570 ,
1580 PRINT
1590 PRINT
1600 COLOR 15
1610 PRINT "INPUT TYPE AND LEVEL OF MANUAL AS A TWO DIGIT NUMBER"
1620 PRINT "THE FIRST DIGIT SHOULD BE ENTERED AS A:"
1630 COLOR 7
1640 FOR P1% = 1 TO 11

```

1650 NEXT PIX
1660 COLOR 15
1670 PRINT "THE SECOND DIGIT SHOULD BE ENTERED AS A:"
1680 COLOR 7
1690 FOR P2% = 1 TO 6
1700 PRINT PROMPT2$(P2%)
1710 NEXT P2%
1720 INPUT "SELECT AN OPTION": LS
1730 IF LS = "V" THEN P1$ = VAL(LS)
1740 L=VAL(L$)
1750 IF LEN(L$) = 3 THEN P1$=LEFT$(L$,2)
1760 IF LEN(L$) = 2 THEN P1$=LEFT$(L$,1)
1770 P2$=RIGHT$(L$,1)
1780 P1% =VAL(P1$):P2% =VAL(P2$)
1790
1800 IF L = 11 GOTO 2980
1810 IF L = 12 GOTO 3020
1820 IF L = 13 GOTO 3060
1830 IF L = 14 GOTO 3100
1840 IF L = 15 GOTO 3140
1850 IF L = 16 GOTO 3180
1860 IF L = 21 GOTO 3220
1870 IF L = 22 GOTO 3260
1880 IF L = 23 GOTO 3300
1890 IF L = 24 GOTO 3340
1900 IF L = 25 GOTO 3380
1910 IF L = 26 GOTO 3420
1920 IF L = 31 GOTO 3460
1930 IF L = 32 GOTO 3500
1940 IF L = 33 GOTO 3540
1950 IF L = 34 GOTO 3580
1960 IF L = 35 GOTO 3620
1970 IF L = 36 GOTO 3660
1980 IF L = 41 GOTO 3220
1990 IF L = 42 GOTO 3260
2000 IF L = 43 GOTO 3300
2010 IF L = 44 GOTO 3340
2020 IF L = 45 GOTO 3380
2030 IF L = 46 GOTO 3420
2040 IF L = 51 GOTO 3700
2050 IF L = 52 GOTO 3740
2060 IF L = 53 GOTO 3780
2070 IF L = 54 GOTO 3820
2080 IF L = 55 GOTO 3860
2090 IF L = 56 GOTO 3900
2100 IF L = 61 GOTO 3700
2110 IF L = 62 GOTO 3740
2120 IF L = 63 GOTO 3780
2130 IF L = 64 GOTO 3820
2140 IF L = 65 GOTO 3860
2150 IF L = 66 GOTO 3900
2160 IF L = 71 GOTO 3940
2170 IF L = 72 GOTO 3980
2180 IF L = 73 GOTO 4020
2190 IF L = 74 GOTO 4060
2200 IF L = 75 GOTO 4100

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```
2210 IF L = 76 GOTO 4140
2220 IF L = 81 GOTO 4180
2230 IF L = 82 GOTO 4220
2240 IF L = 83 GOTO 4260
2250 IF L = 84 GOTO 4300
2260 IF L = 85 GOTO 4340
2270 IF L = 86 GOTO 4380
2280 IF L = 91 THEN INPUT "FULL, HALF, OR QUARTER PAGE "; E$
2290 A = 0
2300 B = 0
2310 C = 0
2320 E = 0
2330 F = 0
2340 IF E$ = "FULL" GOTO 4420
2350 IF E$ = "HALF" GOTO 4460
2360 IF E$ = "QUARTER" GOTO 4500
2370 IF L = 92 THEN INPUT "FULL, HALF, OR QUARTER PAGE "; E$
2380 A = 0
2390 B = 0
2400 C = 0
2410 E = 0
2420 F = 0
2430 IF E$ = "FULL" GOTO 4540
2440 IF E$ = "HALF" GOTO 4580
2450 IF E$ = "QUARTER" GOTO 4620
2460 IF L = 93 THEN INPUT "FULL, HALF, OR QUARTER PAGE "; E$
2470 A = 0
2480 B = 0
2490 C = 0
2500 E = 0
2510 F = 0
2520 IF E$ = "FULL" GOTO 4660
2530 IF E$ = "HALF" GOTO 4700
2540 IF E$ = "QUARTER" GOTO 4740
2550 IF L = 94 THEN INPUT "FULL, HALF, OR QUARTER PAGE "; E$
2560 A = 0
2570 B = 0
2580 C = 0
2590 E = 0
2600 F = 0
2610 IF E$ = "FULL" GOTO 4780
2620 IF E$ = "HALF" GOTO 4820
2630 IF E$ = "QUARTER" GOTO 4860
2640 IF L = 95 THEN INPUT "FULL, HALF, OR QUARTER PAGE "; E$
2650 A = 0
2660 B = 0
2670 C = 0
2680 E = 0
2690 F = 0
2700 IF E$ = "FULL" GOTO 4900
2710 IF E$ = "HALF" GOTO 4940
2720 IF E$ = "QUARTER" GOTO 4980
2730 IF L = 96 THEN INPUT "FULL, HALF, OR QUARTER PAGE "; E$
2740 A = 0
2750 B = 0
2760 C = 0
```

```
2770 E = 0
2780 F = 0
2790 IF ES = "FULL" GOTO 5020
2800 IF ES = "HALF" GOTO 5060
2810 IF ES = "QUARTER" GOTO 5100
2820 IF L = 101 GOTO 5060
2830 IF L = 102 GOTO 5100
2840 IF L = 103 GOTO 5140
2850 IF L = 104 GOTO 5180
2860 IF L = 105 GOTO 5220
2870 IF L = 106 GOTO 5260
2880 IF L = 111 GOTO 5300
2890 IF L = 112 GOTO 5340
2900 IF L = 113 GOTO 5380
2910 IF L = 114 GOTO 5420
2920 IF L = 115 GOTO 5460
2930 IF L = 116 GOTO 5500
2940 PRINT
2950 PRINT "ERROR IN OPTION SELECTION , PLEASE RE-ENTER TWO DIGIT NUMBER"
2960 RESTORE 2990
2970 GOTO 1730
2980 READ Q,R,S,T,U
2990 DATA 3,4,.4,.3,.4,.6
3000 READ Q,R,S,T,U
3010 GOTO 5620
3020 RESTORE 3030
3030 DATA 2,2,.3,2,.3,.5
3040 READ Q,R,S,T,U
3050 GOTO 5620
3060 RESTORE 3070
3070 DATA 4,4,.6,.4,.6,.8
3080 READ Q,R,S,T,U
3090 GOTO 5620
3100 RESTORE 3110
3110 DATA 2,7,.5,.3,.5,.7
3120 READ Q,R,S,T,U
3130 GOTO 5620
3140 RESTORE 3150
3150 DATA 6,8,.8,.6,.8,1.2
3160 READ Q,R,S,T,U
3170 GOTO 5620
3180 RESTORE 3190
3190 DATA 4,6,.6,.4,.6,.8
3200 READ Q,R,S,T,U
3210 GOTO 5620
3220 RESTORE 3230
3230 DATA 1,5,.4,.3,.4,.6
3240 READ Q,R,S,T,U
3250 GOTO 5620
3260 RESTORE 3270
3270 DATA 1,1,.3,2,.3,.5
3280 READ Q,R,S,T,U
3290 GOTO 5620
3300 RESTORE 3310
3310 DATA 2,0,.6,.4,.6,.8
3320 READ Q,R,S,T,U
```

33390 GOTO 5620
33340 RESTORE 3350
33350 DATA 1.7,.5,.3,.5,.7
33360 READ Q,R,S,T,U
33370 GOTO 5620
33380 RESTORE 3390
33390 DATA 3.2,.8,.6,.8,1.2
34400 READ Q,R,S,T,U
34100 GOTO 5620
34200 RESTORE 3430
34300 DATA 2.2,.6,.4,.6,.8
34400 READ Q,R,S,T,U
34500 GOTO 5620
34600 RESTORE 3470
34700 DATA 3.4,2.4,.3,.4,.6
34800 READ Q,R,S,T,U
34900 GOTO 5620
35000 RESTORE 3510
35100 DATA 2.2,1.3,.2,.3,.5
35200 READ Q,R,S,T,U
35300 GOTO 5620
35400 RESTORE 3550
35500 DATA 4.4,3.6,.4,.6,.8
35600 READ Q,R,S,T,U
35700 GOTO 5620
35800 RESTORE 3590
35900 DATA 2.7,2.1,.3,.5,.7
36000 READ Q,R,S,T,U
36100 GOTO 5620
36200 RESTORE 3630
36300 DATA 6.8,4.8,.6,.8,1.2
36400 READ Q,R,S,T,U
36500 GOTO 5620
36600 RESTORE 3670
36700 DATA 4.6,3.4,.4,.6,.8
36800 READ Q,R,S,T,U
36900 GOTO 5620
37000 RESTORE 3710
37100 DATA 2.5,.4,.3,.4,.6
37200 READ Q,R,S,T,U
37300 GOTO 5620
37400 RESTORE 3750
37500 DATA 1.9,.3,.2,.3,.5
37600 READ Q,R,S,T,U
37700 GOTO 5620
37800 RESTORE 3790
37900 DATA 4.8,.6,.4,.6,.8
38000 READ Q,R,S,T,U
38100 GOTO 5620
38200 RESTORE 3830
38300 DATA 3.7,.5,.3,.5,.7
38400 READ Q,R,S,T,U
38500 GOTO 5620
38600 RESTORE 3870
38700 DATA 6.8,4.8,.6,.8,1.2
38800 READ Q,R,S,T,U

Program Listing

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3890 GOTO 5620
3900 RESTORE 3910
3910 DATA 4.6,.6,.4..6..8
3920 READ Q,R,S,T,U
3930 GOTO 5620
3940 RESTORE 3950
3950 DATA 3.5,.5,4,.3..4..6
3960 READ Q,R,S,T,U
3970 GOTO 5620
3980 RESTORE 3990
3990 DATA 2.1,.3,.2..3..5
4000 READ Q,R,S,T,U
4010 GOTO 5620
4020 RESTORE 4030
4030 DATA 4.0,.6,.4..6..8
4040 READ Q,R,S,T,U
4050 GOTO 5620
4060 RESTORE 4070
4070 DATA 2.7,.4,.3..5..7
4080 READ Q,R,S,T,U
4090 GOTO 5620
4100 RESTORE 4110
4110 DATA 5.1,.6,.6,.8,1.2
4120 READ Q,R,S,T,U
4130 GOTO 5620
4140 RESTORE 4150
4150 DATA 3.3,.4,.4..6..8
4160 READ Q,R,S,T,U
4170 GOTO 5620
4180 RESTORE 4190
4190 DATA 3.5,1.1,.3..4..6
4200 READ Q,R,S,T,U
4210 GOTO 5620
4220 RESTORE 4230
4230 DATA 1.1,.3,.2..3..5
4240 READ Q,R,S,T,U
4250 GOTO 5620
4260 RESTORE 4270
4270 DATA 8.1,3.6,.4..6..8
4280 READ Q,R,S,T,U
4290 GOTO 5620
4300 RESTORE 4310
4310 DATA 4.7,2.5,.3,.5,.7
4320 READ Q,R,S,T,U
4330 GOTO 5620
4340 RESTORE 4350
4350 DATA 12.5,.8,.6..8,1.2
4360 READ Q,R,S,T,U
4370 GOTO 5620
4380 RESTORE 4390
4390 DATA 6.2,4.6,.4..6..8
4400 READ Q,R,S,T,U
4410 GOTO 5620
4420 RESTORE 4430
4430 DATA 5.4
4440 READ Z

Program Listing

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```
4450 GOTO 5630
4460 RESTORE 4470
4470 DATA 4.3
4480 READ Z
4490 GOTO 5630
4500 RESTORE 4510
4510 DATA 2.4
4520 READ Z
4530 GOTO 5630
4540 RESTORE 4550
4550 DATA 3.3
4560 READ Z
4570 GOTO 5630
4580 RESTORE 4590
4590 DATA 2.2
4600 READ Z
4610 GOTO 5630
4620 RESTORE 4630
4630 DATA 1.3
4640 READ Z
4650 GOTO 5630
4660 RESTORE 4670
4670 DATA 9.6
4680 READ Z
4690 GOTO 5630
4700 RESTORE 4710
4710 DATA 5.4
4720 READ Z
4730 GOTO 5630
4740 RESTORE 4750
4750 DATA 3.6
4760 READ Z
4770 GOTO 5630
4780 RESTORE 4790
4790 DATA 6.5
4800 READ Z
4810 GOTO 5630
4820 RESTORE 4830
4830 DATA 3.3
4840 READ Z
4850 GOTO 5630
4860 RESTORE 4870
4870 DATA 2.5
4880 READ Z
4890 GOTO 5630
4900 RESTORE 4910
4910 DATA 11.0
4920 READ Z
4930 GOTO 5630
4940 RESTORE 4950
4950 DATA 7.6
4960 READ Z
4970 GOTO 5630
4980 RESTORE 4990
4990 DATA 5.8
5000 READ Z
```

5010 GOTO 5630
5020 RESTORE 5030
5030 DATA 7.6
5040 READ Z
5050 GOTO 5630
5060 RESTORE 5070
5070 DATA 5.4
5080 READ Z
5090 GOTO 5630
5100 RESTORE 5110
5110 DATA 4.6
5120 READ Z
5130 GOTO 5630
5140 RESTORE 5150
5150 DATA 6.6
5160 READ Z
5170 GOTO 5630
5180 RESTORE 5190
5190 DATA 4.5
5200 READ Z
5210 GOTO 5630
5220 RESTORE 5230
5230 DATA 10.8
5240 READ Z
5250 GOTO 5630
5260 RESTORE 5270
5270 DATA 7.7
5280 READ Z
5290 GOTO 5630
5300 RESTORE 5310
5310 DATA 12.2
5320 READ Z
5330 GOTO 5630
5340 RESTORE 5350
5350 DATA 8.8
5360 READ Z
5370 GOTO 5630
5380 RESTORE 5390
5390 DATA 17.6
5400 READ Z
5410 GOTO 5630
5420 RESTORE 5430
5430 DATA 8.2
5440 READ Z
5450 GOTO 5630
5460 RESTORE 5470
5470 DATA 28.8
5480 READ Z
5490 GOTO 5630
5500 RESTORE 5510
5510 DATA 14.4
5520 READ Z
5530 GOTO 5630
5540 RESTORE 5550
5550 DATA 40.
5560 READ Z

Program Listing

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5570 GOTO 5630
5580 RESTORE 3590
5590 DATA 20.
5600 READ Z
5610 GOTO 5630
5620 Z = 0
5630 WRITER = A * Q
5640 ENGINEER = B * R
5650 EDITOR = C * S
5660 CLERICAL = E * T
5670 LAYOUT = F * U
5680 ILLUSTRATOR = D * Z
5690 REM XX = WRITER HOURLY RATE TIMES VALIDATION HOURS
5700 XY = VH * M
5710 REM XY = ENGINEER HOURLY RATE TIMES VALIDATION HOURS
5720 XY = VH * N
5730 REM XZ = TECHNICIAN HOURLY RATE TIMES VALIDATION HOURS
5740 XZ = VH * K
5750 REM YX = WRITER HOURLY RATE TIMES VERIFICATION HOURS
5760 YX = VN * M
5770 VALIDATION = XX+XY+XZ
5780 VERIFICATION = YX
5790 TOTAL = WRITER+ENGINEER+EDITOR+ILLUSTRATOR+CLERICAL+LAYOUT
5800 CVALIDATION = CVALIDATION + VALIDATION
5810 CYVERIFICATION = CYVERIFICATION + VERIFICATION
5820 XGTOTAL = (TOTAL * X) + VALIDATION + VERIFICATION
5830 COSTMAT = XGTOTAL * 9.0000001E-02
5840 GA = (XGTOTAL + COSTMAT) * 6
5850 OVERHEAD = (GA*XGTOTAL+COSTMAT) * OV
5860 PROFIT = (OVERHEAD+GA)*XGTOTAL+COSTMAT) * P
5870 CONTRACT = XGTOTAL+GA+OVERHEAD+PROFIT+COSTMAT
5880 TECHPLAN = CONTRACT*.013
5890 CHARITE = CHARITE + WRITER
5900 CENGINEER = CENGINEER + ENGINEER
5910 CEDITOR = CEDITOR + EDITOR
5920 CILLUSTRATOR = CILLUSTRATOR + ILLUSTRATOR
5930 CCLERICAL = CLERICAL + CLERICAL
5940 CLAYOUT = CLAYOUT + LAYOUT
5950 CCOSTMAT = CCOSTMAT + COSTMAT
5960 CXGTOTAL = CXGTOTAL + XGTOTAL
5970 CGA = CGA + GA
5980 COVHEAD = COVHEAD + OVERHEAD
5990 CPROFIT = CPROFIT + PROFIT
6000 CTOTCONTR = CTOTCONTR + CONTRACT
6010 CTECHPLAN = CTECHPLAN + TECHPLAN
6020 CLS
6030 PRINT:PRINT
6040 LOCATE 1,6;PRINT PROMPT1\$(P1%)
6050 LOCATE 2,6;PRINT PROMPT2\$(P2%)
6060 PRINT:PRINT
6070 MFM1\$= COST PER PAGE:
6080 MFM12\$= ILLUSTRATOR #####.<###
6090 MFM13\$= CLERICAL WORKER #####.<###
6100 PRINT USING MFM1\$;WRITER,ILLUSTRATOR
6110 PRINT USING MFM12\$;ENGINEER,CLERICAL
6120 PRINT USING MFM13\$;EDITOR,LAYOUT

```
6130 PRINT " THE AVERAGE COST PER PAGE IS USING " #######.##"; TOTAL
6140 GTOTAL = TOTAL * X
6150 CGTOTAL = CGTOTAL + GTOTAL
6160 PRINT "THE TOTAL LABOR FOR X PAGES, LEVEL L IS USING ######.##"; GTOTAL
6170 PRINT "THE TOTAL VALIDATION COST IS ######.##"; USING ######.##"; VALIDATION
6180 PRINT "THE TOTAL VERIFICATION COST IS ######.##"; USING ######.##"; VERIFICATION
6190 PRINT "THE COST OF MATERIALS IS USING ######.##"; COSTMATERIAL
6200 PRINT "THE TOTAL GLA IS USING ######.##"; GA
6210 PRINT "THE TOTAL OVERHEAD IS ######.##"; OVERHEAD
6220 PRINT "THE TOTAL PROFIT IS ######.##"; PROFIT
6230 PRINT "THE TECH MANUAL PLAN COST IS USING ######.##"; TECHPLAN
6240 PRINT "THE TOTAL CONTRACT COST IS USING ######.##"; CONTRACT
6250 PRINT:PRINT
6260 COLOR 15;PRINT "Strike any key to continue":COLOR 7
6270 ABC$=INKEY$:IF ABC$=" " GOTO 6270
6280 PRINT "THE TECH MANUAL PLAN COST IS USING ######.##"; TECHPLAN
6290 CLS
6300 PRINT:PRINT
6310 #FM#15%;" CUM COST PER PAGE: WRITER #####.## ILLUSTRATOR #####.##;
6320 #FM#25%;" ENGINEER #####.## CLERICAL WORKER #####.##;
6330 #FM#35%;" EDITOR #####.## LAYOUT #####.##;
6340 PRINT USING #FM#15%;CWRITER,CILLUSTRATOR
6350 PRINT USING #FM#25%;CENGINEER,CLERICAL
6360 PRINT USING #FM#35%;CEDITOR,CLAYOUT
6370 PRINT "THE CUM COST OF LABOR IS ######.##"; CUMTOTAL
6380 PRINT "THE CUM TOTAL VALIDATION COST IS ######.##"; VALIDATION
6390 PRINT "THE CUM TOTAL VERIFICATION COST IS ######.##"; VERIFICATION
6400 PRINT "THE CUM COST OF MATERIALS IS ######.##"; COSTMATERIAL
6410 PRINT "THE CUM TOTAL GLA IS ######.##"; GA
6420 PRINT "THE CUM TOTAL OVERHEAD IS ######.##"; OVERHEAD
6430 PRINT "THE CUM TOTAL PROFIT IS ######.##"; PROFIT
6440 PRINT "THE CUM TECH MANUAL PLAN COST IS ######.##"; TECHPLAN
6450 PRINT "THE CUM TOTAL CONTRACT COST IS ######.##"; CONTRACT
6460 INPUT "DO YOU WANT A HARD COPY OF THIS INFORMATION": BS
6470 IF BS = "NO" GOTO 7010
6480 IF BS = "YES" GOTO 6530
6490 PRINT "ERROR IN SELECTION PLEASE TRY AGAIN"
6500 PRINT
6510 PRINT "THE COST OF X PAGES AT LEVEL L FOR CONTRACTOR #:"; AS
6520 GOTO 6470
6530 LPRINT "THE COST OF X PAGES AT LEVEL L FOR CONTRACTOR #:"; AS
6540 LPRINT " :PROMPT1$(P1%)"
6550 LPRINT " :PROMPT2$(P2%)"
6560 LPRINT " "
6570 LPRINT " "
6580 LPRINT " "
6590 LPRINT " THE FOLLOWING IS THE COST PER PAGE FOR"
6600 LPRINT " WRITER ENGINEER EDITOR #####.##"
6610 FRMTAS$(1) = " #####.##"
6620 LPRINT USING FRMTAS$(1);WRITER,ENGINEER,EDITOR
6630 LPRINT " ILLUSTRATOR CLERICAL WORKER LAYOUT #####.##"
6640 FRMTAS$(2) = " #####.##"
6650 LPRINT USING FRMTAS$(2);ILLUSTRATOR,CLERICAL,LAYOUT
6660 LPRINT " "
6670 LPRINT " THE AVERAGE COST PER PAGE IS USING ######.##"; TOTAL
6680 LPRINT "THE TOTAL LABOR FOR X PAGES @ LEVEL L IS USING ######.##"; GTOTAL
```

Program Listing

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```
6698 LPRINT "THE TOTAL VALIDATION COST IS " USING "#####"; CVALIDATION
6700 LPRINT "THE TOTAL VERIFICATION COST IS " USING "#####"; CVERIFICATION
6702 LPRINT "THE COST OF MATERIALS IS " USING "#####"; CCOSTMAT
6710 LPRINT "THE TOTAL G&A IS " USING "#####"; CGA
6720 LPRINT "THE TOTAL OVERHEAD IS " USING "#####"; COVHEAD
6730 LPRINT "THE TOTAL PROFIT IS " USING "#####"; CPROFIT
6740 LPRINT "THE TECH MANUAL PLAN COST IS " USING "#####"; CTechPlan
6750 LPRINT "THE TECH MANUAL CONTRACT COST IS " USING "#####"; CContract
6760 LPRINT "THE TOTAL CONTRACT COST IS " USING "#####"; CTotContr
6770 LPRINT "THE FOLLOWING IS THE CUM COST PER PAGE FOR" EDITOR
6780 LPRINT "WRITER #####.## #####.##"
6790 FFORMAT(3) = "#####.## #####.##"
6800 LPRINT USING FRMAT(3); CWRITE, CENGINEER, CEDITOR
6810 LPRINT CLERICAL, WORKER LAYOUT #####
6820 FFORMAT(4) = "#####.## #####.## #####.## #####.##"
6830 LPRINT USING FRMAT(4); CILLUSTRATOR, CCLERICAL, CLAYOUT
6840 PRINT
6850 LPRINT "THE CUM COST OF LABOR IS " USING "#####"; CGTOTAL
6860 LPRINT "THE CUM VALIDATION COST IS " USING "#####"; CVALIDATION
6870 LPRINT "THE CUM VERIFICATION COST IS " USING "#####"; CVERIFICATION
6880 LPRINT "THE CUM COST OF MATERIALS IS " USING "#####"; CCOSTMAT
6890 LPRINT "THE CUM TOTAL G&A IS " USING "#####"; CGA
6900 LPRINT "THE CUM TOTAL OVERHEAD IS " USING "#####"; COVHEAD
6910 LPRINT "THE CUM TOTAL PROFIT IS " USING "#####"; CPROFIT
6920 LPRINT "THE CUM TECH MANUAL PLAN COST IS " USING "#####"; CTechPlan
6930 LPRINT "THE CUM TOTAL CONTRACT COST IS " USING "#####"; CContract
6940 LPRINT "THE G&A USED IS " QR "%"
6950 LPRINT "THE OVERHEAD USED IS " O "%"
6960 LPRINT "THE PROFIT USED IS " PR "%"
6970 LPRINT "THE TOTAL VALIDATION HOURS USED IS " VH
6980 LPRINT "THE TOTAL VERIFICATION HOURS USED IS " VN
6990 PRINT
7000 INPUT "DO YOU WANT TO CALCULATE ANOTHER? ENTER YES OR NO"; C$
7010 IF C$ = "YES" GOTO 7070
7020 IF C$ = "NO" GOTO 7140
7030 PRINT "ERROR IN SELECTION PLEASE TRY AGAIN"
7050 PRINT
7060 GOTO 7010
7070 INPUT "DO YOU WANT TO ACCUMULATE TOTALS? ENTER YES OR NO"; D$
7080 IF D$ = "YES" GOTO 310
7090 IF D$ = "NO" GOTO 150
7100 PRINT "ERROR IN SELECTION PLEASE TRY AGAIN"
7110 GOTO 7070
7120 GOTO 7070
7130 GOTO 350
7140 PRINT "GOOD-BYE!"
7150 END
```

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